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Soil organic carbon fractions in uncultivated and tilled profiles of mountain Mediterranean agroecosystems.

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In the global carbon cycle, one of the most important terrestrial pools for carbon storage and exchange with atmospheric $CO_2$is the soil organic carbon (SOC). SOC can be fractionated into two main pools according to the chemical stability and the turnover times. The labile carbon pool is easily degraded and the recalcitrant carbon pool is more stable and because of its much slower turnover time is particularly relevant to the role of soil as a long-term terrestrial C sink. The purpose of this study was to investigate the content and depth distribution of SOC and its pools in selected cultivated and uncultivated soil profiles representing eroding, aggrading and stable sites. Representative soil profiles of Regosols and Calcisols were collected in a typical mountain agroecosystem of NE Spain (42º 01' 42"N, 0º 31' 30"E) with continental-mediterranean climate and mean annual rainfall of around 500 mm. Soil redistribution patterns at the selected sites were characterized using fallout ^{137}Cs radiotracer that allowed distinction of stable, eroded and deposition profiles. Nine profiles were in uncultivated soils (3 eroded, 3 deposition and 3 stable sites), 6 profiles were in cultivated soils (3 eroded and 3 deposition sites). A total of 112 samples were analysed for the content of SOC and the two organic pools, labile and recalcitrant carbon were measured by dry combustion method using a Leco RC-612 multiphase analyser on a sub-sample of the dried interval soil sample. The results indicate that in uncultivated profiles the content of SOC was highest in the surface layers and decreased with depth, following a similar pattern to that of ^{137}Cs. In cultivated profiles such distribution was not evident due to mixing by tillage. In all soil samples the content of labile carbon was higher than the recalcitrant carbon. The content of SOC was highly variable and ranged between 0.09 and 6.91% (mean: 1.69% $\pm$ 1.23). The percentage of labile carbon showed also large variations from 0.09 to 5.77% (mean: 1.10% $\pm$ 0.89), while the recalcitrant carbon varied less between 0.09% and 1.47% (mean: 0.55% $\pm$ 0.38). The content of labile and recalcitrant carbon in uncultivated profiles was significantly higher ($p \leq 0.05$) than in cultivated profiles. In uncultivated soil profiles identified with ^{137}Cs as deposition sites, the content of recalcitrant carbon was slightly higher than in soil profiles affected by erosion. Soil redistribution in non-tilled soils would have implications for the capacity of soils to sequester carbon. The results suggest that the content of labile and recalcitrant carbon in soils are strongly affected by the land use. Further research has to be done for a better understanding of the role of erosion and sedimentation in the distribution patterns of soil organic carbon fractions which is of interest for a better description of the processes involved in SOC dynamics in Mediterranean agroecosystems.